Neighborhood Planning for Community Revitalization

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Green Institute DeConstruction and Used Building Materials Health and Safety Research Project

A CONSORTIUM PROJECT OF: Augsburg College; College of St. Catherine; Hamline University; Higher Education Consortium for Urban Affairs; Macalester College; Metropolitan State University; Minneapolis Community College; Minneapolis Neighborhood Revitalization Program; University of Minnesota (Center for Urban and Regional Affairs; Children, Youth and Family Consortium; Minnesota Extension Service); University of St. Thomas; and Minneapolis community and neighborhood representatives.

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Executive Summary

The DeConstruction Health and Safety research project ran from November 1997 through September 1998. DeConstruction as performed by the Green Institute was defined. Federal Occupational Safety and Health Administration (OSHA) Construction industry regulations and Minnesota OSHA regulations were reviewed for applicability to deconstruction. This review was documented in a table summary form that also provides an index to the federal OSHA construction regulations and MN OSHA rules. Personal protective equipment (PPE) needs were assessed and a list of PPE guidelines was created. An Employee Right-to-Know program was written as per MN Rules. Additional employee training was done using videos from the Minnesota Safety Council and handouts written based on the information in the videos, information learned from employee experience, and regulatory standards for workplace safety. Workplace air sampling was done to determine employee exposure to lead. Sampling activities suggested that deconstruction of materials coated with lead paint can result in employee exposure above the federal OSHA action level of 30 $\mu g/m^3$ if the activities are done for 2.5 or more hours in a workday. Suggested actions are the use of high efficiency respirators, frequent handwashing, and compliance with OSHA standards for employees working above the action level for more than 30 workdays per year. Environmental and public health issues were found to be similar in character to employee safety issues and therefore the former elements were integrated into the project. Asbestos was the primary environmental concern. Federal and Minnesota environmental regulations and rules and MN Department of Health (DOH) rules were reviewed for applicability to deconstruction. Lead bulk dust samples were taken in the ReUse Center to evaluate employee and public exposure to lead in the Center. The floor level was below DOH home standard. The shelf sample was significantly above the DOH standard, the window ledge sample was over five times the DOH standard. It was suggested that window ledges, shelves and other stagnant areas where dust can accumulate should be cleaned regularly. The ReUse Center is currently working with Housing and Urban Development (HUD) and City of Minneapolis staff to implement a program to keep employees, as well as ReUse Center customers and their families safe from lead exposure. Further research is suggested to determine ways to control the amount of lead that enters the Center. Further research is also suggested to determine methods that will reduce deconstruction employee lead exposure on site, for example by wiping down lead painted materials and removing loose dust prior to deconstruction.

Section 1. Introduction

The purpose of the deconstruction health and safety research project was to define deconstruction, assess the hazards that deconstruction employees are exposed to, make recommendations for employee protection, review federal and state OSHA regulations as to their applicability to deconstruction, create a written safety program for The Green Institute's DeConstruction program, assess PPE needs, develop a training program and create written materials to be used in that training program, and to perform air sampling to determine employee exposures to lead and particulates (dust). In addition to this, public safety and environmental concerns associated with deconstruction were investigated. The project also looked into health concerns with respect to lead exposure to employees and customers of the ReUse Center. Diagram 1 was developed to depict the breakdown of the Green Institute Health and Safety Program.

Of existing SIC codes deconstruction is best described by SIC 1795 Wrecking and Demolition. A definition of deconstruction, which can be found in the AWAIR program, is as follows:

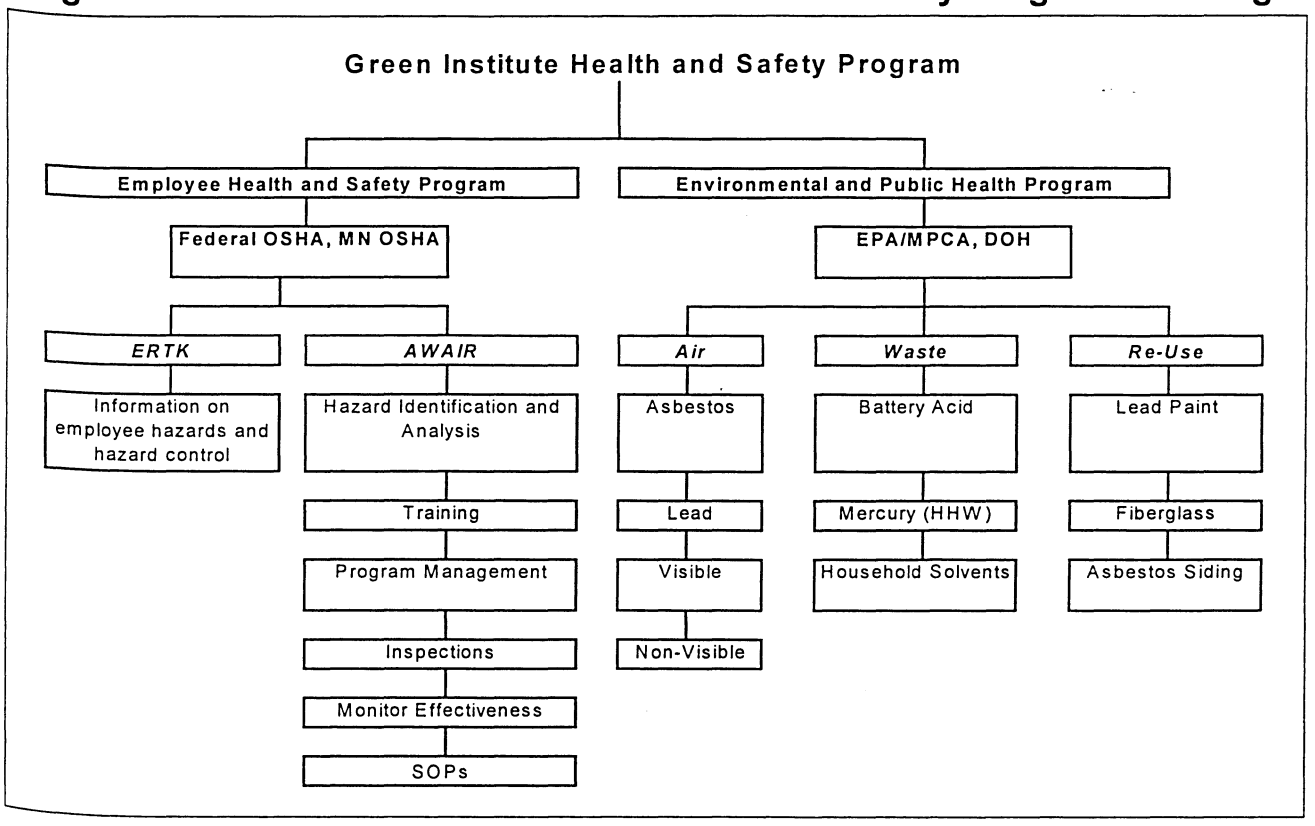
> Deconstruction is the physical removal of building materials that are suitable for reuse or recycle. Items that are intended for reuse must be removed and handled in a way that will minimize damage to them. Reusable items removed from deconstruction sites include small items such as wall hooks and shelving as well as larger items including but not limited to stone decorating materials, appliances, cabinets, windows, flooring, roofing and structural lumber. Recyclable materials include copper, steel and mixed metals from within the structure. Deconstruction is usually performed on residential structures. The duration of a deconstruction project can be anywhere from an afternoon to six weeks. When necessary, demolition and removal of remaining items are done by a subcontractor but this may occur in conjunction with deconstruction activities.

The Green Institute's deconstruction program (DeConstruction Services) is very dynamic and thus this definition is likely to change over time. For example, research is currently being done to determine if it would be feasible to have deconstruction crews do demolition work themselves as opposed to subcontracting.

It is required by Minnesota Rules and Statutes that certain Minnesota employers (deconstruction included) create an Employee Right-to-Know (ERTK) program that will be used to inform employees of hazards in the workplace and A Workplace Accident and Injury Reduction Program (AWAIR) program that will be used to define the employers safety program and explain how the employer will remain in compliance with their safety program. The ERTK program for DeConstruction Services was created as per MN Rules and MN OSHA guidance. A Workplace Accident and Injury Reduction Program (AWAIR) was created as per MN Statutes and OSHA guidance. The ERTK serves as initial employee training in hazards on the worksite. Additional training was done both on and off site[1]. Safety program responsibilities for crew members, crew leaders, management and the safety officer were determined and are documented in the AWAIR program. A comprehensive workplace inspection form was created. A spreadsheet was made to quantitatively assess the effectiveness of the employee safety program. An attempt was made to create standard operating procedures that could be used for compliance assurance. These procedures were not completed because the level of detail required as per the regulations made them ineffective as operating procedures. Standard operating procedures can be very useful from a practical standpoint but are not a particularly strong method for assuring regulatory compliance.

[1] Though on site training (fall protection and scaffolding training) was not done as part of this project it is important to note that it did occur

Diagram 1. Pictoral of Green Institute Health and Safety Program Coverage



In Diagram 1, Air and Waste subheadings under Environmental and Public Health refer to air pollutants that may be created by and waste materials that may require disposal during deconstruction projects. Asbestos of course is a big issue for both employee and public health and much time was spent determining the applicability of asbestos regulations to deconstruction activities. Lead in soil is an environmental and public health concern that requires further study. Visible emissions refer to dust emissions to ambient air during deconstruction activities. Non-visible emissions refer to non-dust emissions that may occur on a deconstruction site, for example emissions of freon from broken refrigeration or air conditioning units or organic emissions from underground tanks. Waste concerns are primarily due to household hazardous waste (HHW) that has been left on site by the current or previous owners or to HHW that is removed during deconstruction (i.e. thermostats, fluorescent lights, PCB ballasts). The primary ReUse center issue is lead exposure to employees and to customers. Other Reuse Center concerns are fiberglass and asbestos siding. Fiberglass was not addressed as part of this project. Because it is not legal to sell asbestos containing siding, all asbestos siding was brought to a landfill that accepts asbestos containing wastes.

A recommendation was made for a continuance of the Green Institute Health and Safety Project. The three main goals of this continuance would be to expand the employee safety program for the ReUse Center, to create a Green Institute Public Health Program which would include both Deconstruction and ReUse policies to protect the health of the public, and to research methods that can be used to reduce lead exposure on deconstruction sites and in the ReUse Center.

A task summary was put together that lists all of the tasks that were done as part of this project, a short description of the task and an approximation of the time required to complete the task. This list is included in the Appendix and can be referred to as a documentation of methods.

Section 2. AWAIR and ERTK

Creation of A Workplace Accident and Injury Reduction (AWAIR) program is required by MN Statute 182.653 Subdivision 8[2]. This program serves as a compliance plan for DeConstruction Services with regards to OSHA regulations. It outlines what DeConstruction Services recognizes as employee hazards as well as the procedures that can be used to reduce employee exposure to those hazards. This compliance plan could be used by OSHA inspectors as a checklist with which to verify that DeConstruction Services is adequately addressing employee hazards and is properly documenting important paperwork (e.g. inspections, injuries, etc.). If an OSHA inspector ever came to deconstruction services, the AWAIR program is probably one of the first items they would request to see. The AWAIR program defines: deconstruction as per the Green Institute's program; employee and management responsibilities with regards to workplace safety; employee hazards and their analysis; company communication and training policies; accident investigation and corrective action procedures; medical care policies; emergency action plans; program enforcement and a means to measure program effectiveness. The AWAIR program was written for DeConstruction Services and is specific to the work performed by DeConstruction Services but could be used as a template for other deconstruction operations in their efforts to create a safety program. In order to monitor program effectiveness a spreadsheet was created to compare the accident rate at DeConstruction Services to the accident rates of similar industries such as residential construction and carpentry. A copy of this spreadsheet can be found in the Appendix. Though the data for DeConstruction Services is not as accurate as the data for other industries, the numbers can still be compared and a significantly different accident rate for deconstruction should be considered as a indication that employee safety efforts may require more attention. The uncertainties associated with comparing data from DeConstruction Services to data from much larger industries is discussed in a memo accompanying the spreadsheet

The Employee Right-to-Know (ERTK) program is required by MN Rules Chapter 5205. This is Minnesota's version of the federal Hazard Communication Standard, 29 CFR 1910.1200 and is given to and reviewed with employees on their first day on the job. It provides information on the hazards they will need to deal with in the workplace, what the physical or toxicological result of exposure to these hazards can be, and how to minimize one's exposure to these hazards. As with the AWAIR program, The ERTK program was written for DeConstruction Services and is specific to the work performed by DeConstruction Services but could be used as a template for other deconstruction operations in their efforts to create an ERTK or Hazard Communication program. Information for the creation of the ERTK program and other written materials came from many sources including OSHA regulations, pamphlets and other written materials from MN OSHA and the

[2] An interesting note, the MN Statute that created the requirement for an AWAIR program (Statute 182.653 Subdivision 8) limits MN OSHA's rulemaking authority to the decision of who has to have an AWAIR program. An educated guess why this is so is that the MN legislature recognized the need to reduce regulatory burden on business and perhaps on MN OSHA as well. There has been talk of the possibility of making OSHA a consultative body only because of the difficulties that have been encountered (general non-enforcement and specific overenforcement) with the regulation of workplace safety.

Minnesota Pollution Control Agency (MPCA), Control of Communicable Diseases Manual[3], articles, videos, etc. Copies or photocopies of these resources and the OSHA guidance document can be found in the safety files in the deconstruction office. The ERTK program was continually being updated as new information was found, the final program was completed in August 1998. This program will need to be updated as new hazards and routes of exposure are identified. Most or all of the hazards have already been identified, what may change is the extent to employees are exposed and the routes by which they may be exposed.

[3] Benson, Abram S., ed. "Control of Communicable Diseases Manual", 16th ed., 1995. American Public Health Association.

Section 3. Hazards Assessment & PPE Evaluation

Hazards encountered by employees engaged in de-construction were assessed by attending and participating in site work with the deconstruction crews, through discussions with de-construction crew members, supervisors and management, discussions with personnel at the University of Minnesota's Department of Environmental Health and Safety, MN OSHA, through literature searches and other written information on employee hazards and through workplace air sampling.

After identification, hazards were categorized first by physical or toxicological hazards, second by exposure (routine (daily), frequent (weekly), seasonal) and then by duration of exposure (acute or chronic). Physical hazards include nails, glass, trip and fall hazards, electricity, working temperature, falling objects, noise, power and hand tools, fire and police/weapons[4]. These hazards and their associated exposure routes and protective measures are summarized in Table 1 of the AWAIR program. The primary toxicological hazards of concern for the deconstruction industry were found to be asbestos, lead, wood dust, household dust, carbon monoxide, PCBs[5], mercury, household solvents, battery (sulfuric) acid and animal wastes. These hazards and their associated exposure routes and protective measures are summarized in Table 2 of the AWAIR program. Copies of Tables 1 and 2 from the AWAIR program are in the Appendix. Molds in older water damaged homes could also be an exposure hazard, particularly to people with allergies[6], but this needs to be researched further.

A list of PPE and safety guidelines were developed throughout the course of the project. This list is to be given to new employees in conjunction with the New Employee Safety Orientation to review with them the safety policies established for DeConstruction employees and to emphasize the importance of workplace safety when working for DeConstruction Services.

A comprehensive site evaluation form was created. This form addresses both workplace safety and practical site work concerns. The form can be used as a whole for a pre-site work inspection for a full deconstruction project or sections of the form can be taken out and used individually for site inspections on smaller projects or specific inspections on an existing project. A copy of this form is in the Appendix.

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[4] Two deconstruction employees were held at gunpoint by Minneapolis police officers who were concerned that the deconstruction employees were trespassing and possibly looting a work site. As a result of this experience lawn and vehicle identification signs were made and a policy was introduced to notify local police when DeConstruction employees will be on site.

[5] There is a very limited chance of exposure to PCBs through damaged lighting ballasts

[6] Individual employees will react very differently to molds and the chemicals that molds may give off. In addition to allergic reactions or toxicological reactions to materials like molds or animal wastes, people may also have physical reactions from other materials. There was one case in which two employees appeared to have a physical reaction to degraded foam insulation in which skin that had contacted the powdery substance became red and itchy. The material was an inert polymer foam that had degraded to a dust through the years. It is highly unlikely that such an inert material would cause a toxicological reaction.

Lead Exposure

Lead exposure is measured using a small air pump connected to a cartridge that contains a filter specific for capturing lead and other particles. This filter is then analyzed to determine how much lead accumulated during the sampling activity. Using the amount of lead on the filter, the length of time over which the sampling was performed and the air pumping rate at which samples were taken a value for the lead content in the air can be calculated. The specific methods and sampling techniques are outlined or referenced in pertinent regulations. This data can then be compared to the OSHA standards for lead exposure. The standard of concern for deconsruction is the OSHA action level which is 30 $\mu g/m^3$ (30 micrograms of lead per cubic meter of air for an eight hour period). If an employee could be exposed to a lead levels greater than is 30 $\mu g/m^3$ over an eight hour workday then the employer must take certain precautions as are specified in the OSHA lead standard for the construction industry, 29 CFR 1929.62.

Literature values were acquired for prior air sampling that had been done to estimate lead exposures to people working with lead painted materials. This data is shown in Table 1.

Table 1. Literature Values for Lead Exposures

Activity	Lead Exposure ($\mu g/m^3$)	Source
Exterior		
Heat Gun	2.4	[1]
Wet Sanding	3.4	[1]
Open Flame Torch	9.8	[1]
HEPA Vacuum Exhausted Power Sanding	32.8	[1]
Dry Scraping	70.5	[1]
Dry Sanding	427.7	[1]
Power Sanding Without Exhaust	578.5	[1]
Dry Scraping	120	[2]
Wet Scraping	63	[2]
Interior		
Low Impact Activities [3]	0.1 - 16	[2]

[1] P. Scholz et al., Airnorne Lead Exposures to Residential and Commercial Painters During Surface Preparation, AIHA Lead Issue paper number 146, 1996.
[2] A. Sussell et al., Health Hazard Evaluation Report 93-0818-2646 People Working Cooperatively Cincinnati, Ohio, July 1997.
[3] Low Impact Activities include general repair, weatherization, window replacement, demolition and plumbing. Demolition measurements were probably taken on the general worksite during demolition and therefore would not result in very high exposure levels.

As can be seen in Table 1., heat gun cutting, wet sanding, open flame torch cutting and low impact activities done on lead painted materials had not been found to result in exposures at or in excess of the OSHA action level of 30 $\mu g/m^3$. It should be noted that with the exception of low impact activities the tasks performed in Table 1. were done on the exterior of lead painted homes. The performance of these same tasks indoors is expected to result in greater exposures due to the more stagnant atmosphere.

Air sampling for lead exposure was done on deconstruction sites with lead painted interior trim. Samples were analyzed by EMSL laboratories in Ann Arbor Michigan. Of nine sampling events five gave valid results which are summarized in Table 2. Table 1 lists the items removed during sampling activities, the lead content of the paint that was on these items, the air sampling results, an adjusted exposure level and the amount of time that it would take a person performing the activity to reach the OSHA action level of 30 $\mu g/m^3$. The adjusted exposure level was calculated by applying the sampling results to a 6.5 hour workday. This is based on the fact that deconstruction employees only engage in deconstruction activities for 6.5 hours a day therefore this is the maximum level of lead to which employees could be exposed to in a workday. The time to reach action level was calculated by applying a ratio of the action level to the sampling results to an eight hour day to calculate the amount of time an employee could perform the activity without reaching the action level[7]. For example, if an employee is removing window trim similar to that removed during sampling event number 1 for greater than 4.17 hours they will be exposed to lead levels greater than the OSHA action level.

Table 2. Lead Air Sampling Results

Sample Number	Items Deconstructed	Paint Lead Content (%)	Results ($\mu g/m^3$)	Adjusted Exposure ($\mu g/m^3$)	Time to reach Action Level (hr)
1	window trim	0.7	57.6	46.8	4.17
2	door trim	0.3	51.6	41.9	4.65
3	window trim and baseboards	9.0 and >3.2	31.7	25.8	7.57
4	window and door trim	2.7 and 0.8	48.7	39.6	4.93
5	window and door trim	>5.0 for both	94.4	76.7	2.54

29 CFR 1926.62, OSHA construction standard for lead exposure to employees, sets an action level for lead exposure at 30 $\mu g/m^3$. As can be seen in Table 1, four of the five sampling activities resulted in potential employee exposures above the OSHA action level. There are a number of standards set forth in 29 CFR 1926.62 for employees who are exposed to lead levels above the action level for 30 or more days per year. These include blood monitoring for lead or lead affiliated substances, provision of clothing changing areas, provision of coveralls.

[7] The employee exposure level is a function of the amount of lead in the air and the time to which they are exposed. The OSHA action level assumes an 8 hour workday exposure. An employee can be exposed to lead levels greater than 30 $\mu g/m^3$ and not be considered to have exceeded the action level provided they are not exposed for an 8 hour day. For example, if an employee removes leaded trim and is exposed to a lead level of 50 $\mu g/m^3$ but only performs the trim removal for four hours, their calculated exposure level is 25 $\mu g/m^3$ (50 $\mu g/m^3$ x 8hr/4hr) which is below the OSHA action level of 30 $\mu g/m^3$.

There are many factors associated with the lead exposure levels that result from deconstructing lead painted materials. The aggressiveness by which the materials are removed, the quality of the paint, the amount of lead in the paint and the amount of lead dust that already exists on the materials all will affect the resulting exposure to employees. Lead wipe samples taken from window sills of which the windows were painted with lead paint and sent to EMSL laboratories in Piscataway New Jersey for analysis. These samples had extremely high lead contents ranging from 3,000 to 29,000 $\mu g/ft^2$ (for comparison, Department of Health lead standards for home safety range from 80-500 $\mu g/ft^2$). The degree to which the above factors affect exposure levels are not known and further research is suggested in Section 6 Recommendations.

Lead wipe samples were also taken in the ReUse Center and the results are shown in Table 3. The standard used for comparison here is the Minnesota Department of Health Standard in MN Rule 4761.0400. Legally this standard is used to determine whether or not a household lead dust level is high enough to suggest undergoing lead abatement. Practically this standard can be used to determine if a problem exists and if exposure reduction procedures such as repainting or regular cleaning should be done.

Table 3. ReUse Center Lead Sampling Results

Sampling Number	Sampling Location	Results ($\mu g/ft^2$)	Comparable Standard ($\mu g/ft^2$)
1	staging room floor	200	80
2	display window	1660	500
3	basement shelf	419	300

Section 4. Regulatory Review

Federal OSHA

Applicable federal regulations were searched for and printed from a 1998 electronic version of the BNA Health and Safety Library and from the EPA web page link to the Code of Federal Regulations (CFR) database. Department of Labor regulations are found in Title 29 of the CFR. Chapters under this title were reviewed. Part 1904 Recording and Reporting Occupational Injuries and Illnesses, Part 1910 Occupational Safety and Health Standards and Part 1926 Safety and Health Regulations for Construction were determined to be potentially applicable to de-construction. The vast majority of regulations that DeConstruction Services must be in compliance with are in Chapter 1926. A spreadsheet was prepared to list all of the regulations in 29 CFR 1926 by citation, the title of the citation, applicability determination (yes applicable or no it is not) and, if applicable, a brief description of the contents of the regulation. This spreadsheet serves as an index to the regulations (something which is not provided by the CFR), documentation of applicability determination, and a relatively quick reference to the federal construction safety regulations which can be searched electronically as well as on paper.

Regulatory preambles are a description of the reasons for a regulation or changes made to a regulation. They provide good background information for the meaning behind the regulations. Preambles for federal regulations regarding lead and asbestos were printed and reviewed for background information.

MN OSHA

Minnesota Rules were reviewed using the same method as federal rules. Instead of rewriting rules for safety for the construction industry, Minnesota has referenced 29 CFR 1926 as standards and added some of their own in Chapter 5207 Construction. Chapter 5205 of Minnesota Rules is also applicable to the de-construction industry. This chapter details Minnesota's Employee Right-to-Know program. MN OSHA has been delegated authority from federal OSHA to implement 29 CFR 1900.1200 Hazard Communication regulations. By this authority Minnesota has created the Employee Right-to-Know program that meets federal guidelines for hazard communication. A spreadsheet was prepared to index, document applicability of, and reference Minnesota Rules.

Asbestos

The EPA asbestos NESHAP[8], NESHAP M, was reviewed for applicability to deconstruction work. The only potential applicability to deconstruction, a case which did occur once, is if DeConstruction Services takes title to a property that 1) contains non-friable asbestos that by EPA NESHAP definition can remain in the structure during demolition and 2) DeConstruction Services performs the demolition themselves or subcontracts out the demolition. In this case DeConstruction Services must notify the MPCA within ten days of demolition and must take the asbestos containing debris to a special landfill[9]. In some cases there may also be some special handling requirements for asbestos containing materials that require wetting the materials to keep them from becoming airborne during demolition and/or transport to disposal.

There were some questions regarding the applicability of NESHAP M to DeConstruction Services activities. The final determination was that:

1) even if we are exempt from the EPA regulations we still have to follow OSHA regulations and for us that is the biggest concern. Unlike Department of Health and EPA regulations pertaining to asbestos, there is no threshold limit of asbestos containing materials under which OSHA regulations would not apply to us. Also, for EPA regulations, even if we are not subject to the NESHAP for asbestos, we still are subject to landfilling regulations that require special handling for many asbestos containing wastes[10].

2) It is the MPCA's[11] opinion that we are subject because part of our goal is employee training and therefore our work would be considered an institutional use of a building. As an institutional use, the exemption for residential structures with four or fewer dwelling units no longer applies. It may be in DeConstruction Services best interest to assume that we are subject unless we know for sure that we are not.

3) asbestos is regulated by three agencies. The significant gain we could have by not being subject to the NESHAP is that we would not have to make the ten working day notifications to the MPCA. Though the notification process is a pain that would be nice to avoid, it appears that the only time we have to make the MPCA notification is if we are performing or subcontracting the demolition of a house that has some remaining asbestos containing materials that are going down with the home.

In order to minimize complications in dealing with asbestos regulations DeConstruction Services hires independent contractors to come to the sites to perform asbestos surveys (an OSHA requirement) and to do any necessary asbestos removal. DeConstruction Services has investigated the possibility of training an employee to become a certified asbestos inspector. This would give DeConstruction Services the ability to inspect homes for asbestos containing materials and to take bulk samples of materials suspected to contain asbestos for laboratory

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[8] NESHAP = National Emission Standard for Hazardous Air Pollutants. NESHAPs are a series of air regulations meant to control the releases of hazardous substances to ambient (outdoor) air. NESHAP M is about a 20 page regulation that deals specifically with asbestos. Though this is a federal regulation, the EPA has granted the MPCA the authority to implement the regulation and therefore the MPCA would be the government agency to contact regarding NESHAP M questions.

[9] The EPA has landfilling restriction for asbestos containing wastes. Because of public fear of asbestos many landfills choose much stricter policies for accepting asbestos containing wastes. Though certain types of asbestos are not regulated for landfilling, many or most landfills will not accept them.

[10] conversation with Roger Jeremiah, Asbestos Unit, University of Minnesota Department of Environmental Health and Safety, July 1998

[11] conversation with Jess Richards, MPCA, July 7, 1998

analysis[12]. The inspector would not be certified to do any asbestos removal; therefore a contractor would still need to be hired if any of the suspected asbestos containing materials turned out to be asbestos containing[13].

A fact sheet was created to help answer basic questions about asbestos. A copy of this fact sheet is in the Appendix.

MN Department of Health

If DeConstruction Services is in compliance with OSHA and EPA regulations for asbestos they will also be in compliance with Department of Health (DOH) regulations. The DOH exempts homeowners who own and occupy the house from requiring certification to remove asbestos materials from their own home provided these quantities are below threshold limits. The DOH requires remodeling, mechanical and demolition contractors to be certified in asbestos removal with an exemption for removal of asbestos containing flooring, siding and ceiling materials[14] in homes or apartments with four or fewer dwelling units. Minnesota's certification courses cover OSHA, EPA and DOH rules. Even though the previous noted exemption from DOH rules exists for contractors, there is not a similar exemption for OSHA or EPA regulations and therefore these are the primary concern for deconstruction projects in Minnesota.

[12] by OSHA and EPA definition a materials with greater than 1% asbestos content therefore any materials that contain asbestos in levels lower than 1% are not regulated. All of the asbestos containing materials found during the course of this project had more than 1% asbestos.
[13] There are many different levels of asbestos training and the inspector training was the only level to which is would make fiscal sense to have an employee certified. It was estimated that to make it economically beneficial a certified employee would need to remain with DeConstruction Services for at least 6 months.
[14] These materials are categorized as "non-friable" asbestos and are considered to be of limited health concern because the asbestos fibers are fixed in the material. The exemption for flooring may be repealed though because EPA regulations now consider the soft backing of flooring to be friable.

Section 5. Conclusions and Recommendations

It was found that deconstruction employees face many of the same hazards that are faced by employees of the construction industry but by a different means of exposure or to a different degree of severity.

These similar hazards include fall hazards and falling object hazards, working on scaffolding, exposure to lead, potential for exposure to asbestos, working with tools and power tools, working on ladders and stairways, and working on demolition sites. Though the hazards are the same, the means by which employees can be exposed to these hazards can be different. Deconstruction employees are taking buildings down as opposed to building them up and in some cases are working with very old materials as opposed to new materials. Fall hazards and falling object hazards can be associated with both the stability of the materials that make up the structure as well as the stability of the structure itself. There is a greater concern for foot punctures from removed items that have not yet been denailed. Electricity hazards are not because of the assembling of electrical systems but the removal of materials that are connected to or near those systems. Another electricity concern is the verification that the source of electricity is known, there may be subsidiary electrical boxes, particularly in homes that have had significant prior renovations. Lead exposures due to working with lead painted materials pose a serious hazard for deconstruction employees. In addition to these hazards deconstruction employees have a much greater chance of being exposed to zoonotic disease carriers (live animals, animal carcasses and animal wastes) and molds.

Construction hazards that are not a concern, or much less of a concern, to deconstruction employees include trenches and ditches, working with heavy machinery, working on or near roads, the use of power actuated tools and welding equipment, excavations, steel erection, blasting and explosives, and working on or with cranes and derricks.

Recommendation for further study:

- research on the feasibility and efficacy of wiping down lead painted materials prior to deconstruction
- research on the feasibility and efficacy of wiping down lead painted materials prior to transport to the ReUse Center
- development of a HEPA vacuum loaner plan for the ReUse Center
- determination of whether it is better to develop practices to minimize the amount of lead that can end up in the soil when crews are working with lead painted materials outdoors or to simply not allow work (e.g. denailing) on lead painted materials outdoors
- development of a system to assure that houses that are demolished by deconstruction crews or a subcontrator of DeConstruction Services are done so properly (i.e. wetted to avoid particulate or lead exposure to the public or environment)

- creation of a written Emergency Action Plan as per 29 CFR 1926.35 (this will be more important when DeConstruction Services gets 3-4 crews running and there is the possibility of having many people (20+) on site at once)
- noise level monitoring on deconstruction sites, particularly when hammering prybars
- creation of a written lock-out-tag-out program for electricity and equipment
- investigate mold exposure/bioaeresols and write an SOP for working in water damaged buildings
- creation of a deconstruction safety video
- research and sampling for particulate exposure on deconstruction sites

APPENDIX

List of Acronyms

AWAIR	A Workplace Accident and Injury Reduction Program, required by MN OSHA
CFR	Code of Federal Regulations
DOH	Department of Health, a state agency
ERTK	Employee Right to Know, Minnesota's version of the federal hazard communication standard which requires disclosure of workplace hazards to affected employees
HUD	Housing and Urban Development
MPCA	Minnesota Pollution Control Agency
NESHAP	National Emission Standard for Hazardous Air Pollutants, federal air quality standard
OSHA	Occupational Health and Safety Administration
PPE	Personal Protective Equipment
SOP	Standard Operating Procedure

Table 1.

Hazardous Substances found at De-Construction Sites.

Hazard	Source	Possible Effects	How to Avoid the Hazard	Frequency of Exposure	Duration for Effect
Household Dust	Working indoors.	Respiratory illness, may cause illness with flu-like symptoms depending on what is in dust.	Respiratory protection (i.e. face masks), frequent handwashing, particularly before eating.	Daily.	Acute or chronic .
Wood Dust	Sawing and cutting materials.	Respiratory illness, some woods have cancer-causing properties.	Respiratory protection (i.e. face masks), frequent handwashing, particularly before eating.	Weekly.	Chronic.
Lead	Paint, window blinds, leaded pipes.	High blood pressure, memory or concentration problems, digestive problems, joint pain and damage to reproductive systems.	Respiratory protection, HEPA respirators should be worn whenever there is the potential for working with lead based paints or cutting through leaded pipes. Paints in older homes (pre 1978) are tested for lead prior to working on painted materials. Frequent handwashing.	Weekly.	Chronic.
Asbestos	Pipe insulation, floor tile, ceiling tile, roofing felt, siding, maybe plaster.	Respiratory illness, lung cancer, asbestosis.	Asbestos containing materials are removed from the work site prior to any danger of employee exposure.	Rarely if ever.	Chronic.
CO	Vehicle or other exhausts.	Headache, nausea, brain damage.	Keep exhaust fumes out of confined areas. Rules and limits for driving van into the warehouse.	Weekly.	Acute.
PCBs	PCB ballasts.	Cancer, damage to reproductive systems.	PCB ballasts are removed from work sites as household hazardous waste. These materials are only hazardous if broken so that the PCBs can be released.	Rarely if ever.	Chronic.
Mercury	Fluorescent lights, thermostats.	Damage to nervous systems.	These materials are removed from the work site.	Rarely if ever.	Chronic.
Household Chemicals	Chemicals stored and previously used in buildings	Dizziness, toxic effects (particularly if mixed together), fire hazard	Procedure to move any household chemicals out of the work area, ERTK training warns that chemicals cannot be mixed	Weekly or monthly	Acute or chronic.
Methane (Natural gas)	Gas lines.	Toxic effects, explosion, fire.	Procedure to cut off gas supply when performing any tasks that could result in a gas leak.	Rarely if ever.	Acute.
Sulfuric (Battery) Acid	Old, deteriorated or leaking car batteries.	Acid burns, eye injuries, possibly blindness.	Procedure to remove any batteries from a work area. Broken or deteriorated batteries should be removed wearing gloves and eye protection. Employees know first aid procedures for chemical exposure to the eyes.	Rarely.	Acute.
Animal Wastes	Carpets, plaster, attics, basements, outdoors.	Flu-like illnesses.	Respiratory protection, frequent handwashing.	Weekly.	Acute.

Table 2.
Harmful Physical Agents found at De-Construction sites.

Hazard	Source	Possible Effects	How to Avoid the Hazard	Frequency of Exposure	Duration for Effect
Nails	Trim and flooring.	Body punctures or cuts, tetanus.	Remove nails before stacking. Work gloves, boots, and sturdy clothing. Tetanus shots are recommended at hire.	Daily.	Acute.
Glass	Broken windows or lights.	Body punctures, tetanus, cuts, abrasions.	Work gloves, boots, and sturdy clothing. Remove broken glass from work area ASAP. Tetanus shots are recommended at hire.	Daily.	Acute.
Electricity	Exposure to live electric lines inside or outside buildings, power tool use.	Severe burns, shock, possibly death.	Lock out indoor electric lines whenever work creates a danger of exposure. Check cords on power tools before use. When setting up scaffolding or ladders check that neither an employee nor any equipment may come into contact with the power line 1) during work or 2) in the event that the scaffolding or ladder tips.	Weekly.	Acute.
Trip/Fall Hazards	Cluttered walkways and work areas, holes in floor, working on ladders, scaffolding, or roofs.	Abrasions, broken bones, concussion, chronic back or bodily injury, paralysis, possibly death.	Good housekeeping. Mark holes in work surfaces with yellow cones and with tape if the hole is large enough that a person may fall through it. Follow ladder guidelines. Use personal fall arrest systems or guardrails for roofs and scaffolding. Only employees experienced in scaffolding erection or dismantling can lead these tasks. The buddy system must be used when erecting or dismantling scaffolding.	Daily.	Acute or chronic.
Working Temperature (heat and cold stress)	Winter and summer in Minnesota.	Heat stroke, hypothermia.	Work-rest regimens, dressing in warm breathable layers in the winter, in cool breathable layers in summer. Training on the recognition of temperature related illness and working in temperature extremes.	Seasonal.	Acute.
Power and Hand Tools	Working with power and hand tools.	Burns, cuts, punctures, loss of appendages, electricution.	Do not handle tool blades immediately after use. Check cords on power tools before use, only use tools for the purposes they are intended. Tag out any broken or damaged tools and remove them from the work area.	Daily.	Acute.
Falling Objects	Working below scaffolding or ladders; working on lower floors.	Cuts, abrasions, concussion, possibly death.	Let other employees know (yell "below!") whenever walking under an active work level (i.e. ladders, scaffolding, roof work area). Avoid working or walking under noisy work areas (where others might not hear your). Use hard hats.	Weekly.	Acute.
Noise	Noisy equipment.	Hearing loss.	Ear plugs.	Weekly.	Acute or chronic.
Fire	Sawing old wood, smoking, flammables, electrical fires.	Burns, respiratory injury, possible death.	A fire extinguisher is on site and is checked for pressurization every day, employees are trained in how to use a fire extinguisher, policy to change out dull blades or a blade that causes the wood to smoke.	Acute.	Daily.
Police and Guns	Working in houses, particularly in urban areas.	Injury, death, at least a good scare.	Procedures to drop tool belt, put hands up, and call office on cell. Written agreement from property owner kept on site and use of yard signs to show our presence.	Rarely.	Acute.

Injury Incidence

Industry	Incidence Rates				
		Lost Workday Cases [2]			
	Total Cases [1]	Total [4]	Cases With Lost Work Days [5]	Cases Without Lost Workdays [3]	Total Cases by NSC [7]
General Building Contractors	9.8	4.4	3.8	5.4	7.34
Residential Construction	8.6	4.2	3.9	4.4	
Nonresidential Construction	11.2	4.7	3.7	6.5	6.91
Carpentry and Floor Work	10.8	5.4	4.9	5.3	
Special Trade Contractors	11.1	5	4.4	6.1	3.99
Deconstruction [6]	65.5	65.5	65.5	0	
Deconstruction + Store	32.7	32.7	32.7	0	
Misc. Special Trade Contractors					3.00

Footnotes:

[1] Total cases include all work-related injuries that result in loss of consciousness, restriction of work activity or motion, transfer to another job, or require medical treatment other than first aid but do not necessarily result in subsequent lost work days.

Total cases are in cases per year per 100 full time employees:

$$\text{incidence rate} = \frac{\text{\# of injuries and illnesses x 200,000}}{\text{total hours worked by all employees during period covered}}$$

numerator: 200,000 represents the hours worked for 100 employees w/ 2 weeks vacation per year
denominator: uses actual hours worked to get an accurate incidence rate, this includes all employee hours, including administrative personnel hours

[2] Lost Workday Cases are cases that involve more than one day away from work or of restricted work activity subsequent to the date on which the injury occurred.

[3] Cases Without Lost Workdays are cases that do not involve lost workdays but result in medical treatment other than first aid, restriction of work or motion, loss of consciousness, transfer to another job, or diagnosis of occupational illness. (ex. requires doctor visit but can return to work the next day)

[4] Total Lost Work Day Cases are cases in which the employee missed one or more workdays following the date on which the accident occurred.

[5] Lost Work Days are days in which an employee was away from work.

[6] deconstruction injuries included here were taken from the OSHA 200 log of injuries and illnesses.

To calculate Total Cases as in [1] the following data were used:

numerator = # of injuries x 200,000
*denominator = decon employees*40 hours per week*years in operation*50 work weeks per year*

Average # of full time employees	Injury Occurrence	Years in Operation	Total Cases (numerator)	Total Cases (denominator)	Total cases
10	6	0.917	1200000	18333	65
20	6	0.917	1200000	36667	33

From OSHA log	*Employee*	Affected Area	Days Away from Work*	Days of Restricted Work Activity*
Entry #1	X	foot	1	0
Entry #2	Y	eye	1	0
Entry #3	X	back	2	2
Entry #4	Z	hand	1	2
Entry #5	Y	eye	1	0
Entry #6	W	head	8+	5+

**subsequent to the date of the injury*
[7] Total cases from NSC were calculated in the same way as [1] but used OSHA 200 log data obtained by NSC members participating in the Occupational Safety/Health Award.

MEMO

To: Bob Alf
From: Anne Marie Johnson
Re: Accident Incidence
Date: August 31, 1998

Attached are some calculations that have been done to get some values representing our accident record in DeConstruction. The footnotes for the calculations give a pretty good explanation of where the numbers came from and how they were calculates. I suggest that this table is updated every time an accident occurs. At this point DeConstruction has a small "sample size" to use for calculation purposes but it is still a useful exercise and should be used along with other considerations to determine the effectiveness of our safety program.

There are many things to consider when looking at these numbers.

1. The incidence rates (Total Cases [1]) calculated here are for an entire company and include administrative hours and personnel as well as on site employees. One might argue that we could consider the Green Institute as the company and include ReUse center employee hours but I believe that would be considered circumvention and would stray from the purpose of this tracking exercise. It is valid though that the incidence rates calculated for other industries will be affected (reduced) if companies within that industry also offer consulting or other administrative or information services for which employees are in a much less hazardous environment.

2. Because DeConstruction is a small business we have a small sample size. This means that one or two accidents can make a significant difference in our calculated incidence rate. I spoke with Rick Reber at Minnesota Safety Council and he said that we should take the incidence values we get with a grain of salt but that if we have a significantly higher incidence rate this may provide motivation to look closer at the safety program.

3. The accuracy of the information on which incidence rate calculations were done for other industries also depends on the accuracy to which those industries perform their OSHA tracking. Industries who track poorly are likely to have incidence rates that are less then reality.

Asbestos and Residential De-Construction: Most Commonly Asked Questions

Disclaimer: This document is not intended as a substitute for contacting the appropriate agencies or reading the rules and regulations and making your own independent applicability determination for your project. Examples in this document do not represent an exhaustive listing of types of materials or projects for which the rules and regulations might apply.

1. What is asbestos?

Asbestos is a fiber that was once mined and used extensively as an insulating and binding material for various building materials. When asbestos was first used it was hailed for its effectiveness as an insulating material but was later found to be extremely hazardous to respiratory systems. The two main categories of asbestos containing materials are friable and non-friable. Friable materials, for example pipe insulation and the paper backing of some flooring tiles, are defined as materials that can easily release particles into the air. Non-friable materials, for example siding that is in good condition, have the asbestos fibers tightly bound within the material and therefore the fibers cannot easily become airborne. As can be inferred from these definitions, friable materials are considered to be much more hazardous than non-friable materials.

2. What health effects are associated with exposure to asbestos?

Asbestos can cause lung cancer (mesothelioma) and a respiratory disease known as asbestosis which causes the lining in the lungs to harden. Asbestos is also known to cause stomach cancer if ingested (primarily through hand to mouth contact). The effects of asbestos are not seen until 11 to 20 years after a person is exposed. As long as asbestos is contained it cannot hurt anyone but once the fibers are released into the air they can be inhaled or ingested and cause health problems.

3. Where can asbestos be found?

The most common materials found to contain asbestos are floor tiles and pipe wrap insulation but asbestos can be found in ceiling tiles, roofing materials, siding and other items. The Department of Health (DOH) (215-0700, 1-800-627-3529) can give advice to homeowners who wish to identify or remove asbestos containing materials from their own homes (the homeowner must both own and occupy the home and the home must be used for purely residential purposes, call DOH for more details on what projects can be done by homeowners). Alternatively, a homeowner could hire, or may be required to hire, a certified contractor to identify and or remove asbestos containing materials.

4. When was asbestos used in homes?

Asbestos was primarily used in the 1950's and 60's but OSHA (Occupational Safety and Health Administration) regulations require that an inspection is done prior to demolition or renovation of any home that was built or renovated before 1980. OSHA regulations do not apply to the individual homeowner but this timeline could be used to judge whether or not a homeowner should be concerned about having asbestos containing materials in the home.

5. Who determines what has to be done with asbestos and how it is to be removed?

In Minnesota, the Minnesota Department of Health is in charge of protecting homeowners and the general public from exposure to asbestos. They can give homeowners advice on how to safely remove asbestos from the home. OSHA is responsible for seeing that people who work with or around asbestos are informed and protected. They have regulations pertaining to employee training and work practices for the removal of asbestos. The Minnesota Pollution Control Agency (MPCA) is in charge of the disposal of asbestos and keeping outside air clean of asbestos.

6. How can we get rid of it?

Homeowners who occupy the home for which asbestos is to be removed may do *some* removal projects themselves. If choosing to do the removal yourself, contact the DOH for advice on how to remove properly and to verify that your situation fits within the regulatory exemptions for homeowners. We suggest that any removal of friable asbestos, ex. pipe insulation, be done by a certified contractor. If choosing to do any asbestos removal yourself, contact the DOH for advice on how to do it properly.

7. Will you take care of it?

De-construction Services knows of contractors who are certified to remove asbestos but we cannot do the removal ourselves.

8. How much will it cost?

Depending on the type and amount of asbestos containing materials, a rough estimate for contracting residential removal is anywhere from one hundred to several thousand dollars depending on the materials and amount to be removed.

Green Institute DeConstruction Safety Program
Pre-Work Site Evaluation

Part 1. General and Emergency Information. To be completed prior to work on site.

General Information
Site Phone: Bob Alf's cell 669-3605, site cell 723-5190
Site Address:

Directions to site from office:

Distance to site from office:

Estimated travel time to site from office:

What other contractors will be on site?

Who has been notified of our presence (and the presence of other contractors) on site? (ex. police, neighborhood groups)

When were they notified?

Closest Emergency Room
Name:
Phone:
Address:

Directions to emergency room from site:

Local Fire Department
Phone:
Address:

Preferred Clinic
Phone:
Address:

Green Institute DeConstruction Safety Program
Pre-Work Site Evaluation

Part 2. Safety, Health, and Hazardous Materials
Section 2.1 Household Hazardous Substances

Mercury
Mercury can be found in switches on heating or cooling equipment, thermostats, flourescent lights, neon lights, in pressure gauges, batteries or very rarely may be found as elemental mercury in bottles in garages or work areas. For questions on items that may contain mercury or what to do with mercury containing items see the household hazardous waste (HHW) folder in the safety files. In the interim we can store these items in the de-con office.

1. Are there any mercury containing items on site in locations that may be disturbed during de-construction or demolition activities?
- ❑ Yes. These items must be removed prior to working in areas in which they may be disturbed. For the interim we can store mercury containing wastes in the de-con office.
- ❑ No.

Freon and Other Chlorinated Flourocarbons (CFCs)
Freon and other CFCs are used as refrigerants in refrigerators, freezers, air conditioning equipment, dehumidifiers and fire extinguishers. CFCs are generally not hazardous to humans but will break down the ozone layer. For questions regarding what to do with items containing freon and CFCs call the MPCA at 297-7300.

2. Are there any air conditioning equipment or dehumidifying equipment that may be damaged during deconstruction or demolition activities?
- ❑ Yes. These items must be removed prior to working in areas in which they may be damaged. These must be removed by a person who is certified to work with CFCs.
- ❑ No.

PCBs
PCBs may be found in old lighting ballasts. Assume a ballast has PCBs unless it specifically states on the packaging "non-PCB". Call MPCA Special Wastes Coordinator Ned Brooks at 297-8680 with any questions.

3. Are there any PCB ballasts in the home that may be damaged during de-construction or demolition activities?
- ❑ Yes. These items must be removed prior to working in areas in which they may be damaged. For the interim we can store undamaged PCB containing wastes in the de-con office.
- ❑ No.

Other Household Wastes
Other household wastes include Ni-Cd batteries, corrosive materials (either acid or alkaline), solvents (flammable materials), oils, ammonia, and other household chemicals. Never mix chemicals together. In most cases these materials can be brought to a county drop off site for disposal.

4. Are there any household hazardous wastes that require disposal?
- ❑ Yes.
- ❑ No.

If yes, list the wastes, their location, and how much there is.

See info in the HHW file in the safety files to find out where to bring these materials, when to bring them and how much it will cost to drop them off. If our existing information does not answer all questions then call Darwin Schultz at Hennepin County Environmental Management at 348-6570.

Treated Lumber/Creosote Timbers
Some lumber used in households may have been treated with arsenic compounds or creosote. Testing to determine if lumber has been treated is not feasible because of expense and that some testing procedures may damage the wood.

Green Institute DeConstruction Safety Program
Pre-Work Site Evaluation

Section 2.2 Tanks and Wells.

Underground Storage Tanks (USTs) for Oil or Gasoline

USTs are only an issue if deconstruction takes title to the property or if we are doing a full deconstruction. The existence of a UST may be noted on the title for the property. Other ways to check for a UST are to look for piping from the furnace to an outside wall or an open or patched hole in a wall where piping may have once been. For questions regarding whether a tank may be on site or what to do if a tank is on site call Determan Tank and Well at 571-8110 and speak with Paul Thiesen.

1. Are there signs of the existence of a UST on site?
- ❑ Yes. Call Determan.
- ❑ No.

Wells

Unused wells need to be closed to protect the underlying aquifer from stormwater runoff into the well and from small children or animals falling into the well. If a homeowner plans on using the well at a later time they may be able to get a temporary extension/exemption from well closing.

Wells that are no longer open to the surface may be noted by the existence of a windmill, unaccounted for pipes or areas in the foundation where pipes used to run, well pits or well shacks. If a home was built prior to the existence of a municipal water supply there is a good chance that there may be a well on site. For questions regarding whether or not a well may be located on a property call the MN Geological Survey at 627-7484 or city inspections for the city in which the property resides. MN DOH Well Management Unit (215-0811) can give more information on what to do when a well is found.

2. Is there evidence that any wells may be on site?
- ❑ Yes.
- ❑ No.

If yes, what actions have been taken to close the well?
(Note: closing the well is the responsibility of the property owner. Unless the property has been transferred to the Green Institute, the closing of the well is not our responsibility.)

Section 2.3 Lead

1. Was the home built prior to 1978?
- ❑ Yes. Lead testers must be used on all painted areas for which de-construction will take place.
- ❑ No.

Did any of the lead testers test positive?
- ❑ Yes.
- ❑ No.

If yes, where are the leaded paints located?

At a minimum, paper masks should be worn by employees de-constructing lead painted materials. Employees performing these activities or working in the vicinity of these activities should be supplied with disposable coveralls and a place to dispose of them at the end of the day.

Green Institute DeConstruction Safety Program
Pre-Work Site Evaluation

Section 2.4 Asbestos

General Note Regarding OSHA Regulations:
No de-construction employee can work in an area in which asbestos containing materials (ACM), *defined as materials with > 1% asbestos*, are being disturbed or abated. Employees can work around ACM that is not disturbed. *Materials with < 1% asbestos are not regulated by OSHA or EPA/MPCA.*

1. Was the house built before 1980?
- ☐ Yes. An asbestos survey must be performed by a certified inspector.
- ☐ No. Proceed to next section (Infectious Hazards).

2. If yes, were any ACM found in the survey?
- ☐ Yes.
- ☐ No. Proceed to next section.

3. If yes, what type of materials are they and where are they located? (tile? pipe wrap?)

How much of the materials are present? (in linear feet, square feet, or cubic feet)

4. Are any of the materials friable? (pipe wrap insulation and the paper backing of tile are considered to be friable materials, i.e. any materials that could easily release particles into the air are considered friable)
- ☐ Yes. Which materials?_____
- ☐ No.

5. Could any of the non-friable materials become crumbled or otherwise made friable in the course of de-construction and/or demolition activities?
- ☐ Yes. Which materials? _____. These materials should be considered to be friable during de-construction and/or demolition activities.
- ☐ No.

6. Will the ACM be disturbed during de-construction activities?
- ☐ Yes.
- ☐ No. Go to Question 8.

7. If yes, will the amount of ACM to be disturbed exceed:

260 feet of pipe wrap or 160 square feet on facility components ***or***
35 cubic feet off facility components where the length or area could not be measured?
(note: de-construction activities would be considered a renovation if not a demolition. For calculation of asbestos containing materials disturbed during renovation activities you must sum all of the ACM that will be disturbed during all renovation activities at this work site over the calendar year)

- ☐ Yes. The ACM must be removed prior to de-construction activities. This ***may*** be done by the homeowner if they occupy the home and if they meet Department of Health regulations. Otherwise a certified contractor must be used. If done by a contractor then the contractor must make any required EPA/MPCA notifications and waste handling procedures.
- ☐ No. Provided the house is not to be demolished, EPA/MPCA air quality regulations do not apply to us. If the renovation work requires the disturbing of ACM then a certified contractor (or the homeowner if meeting Department of Health exemptions for homeowners) will have to remove the asbestos before any de-construction activities occur that will disturb the ACM. If a contractor removes the ACM then they will be responsible for the required MPCA notifications and waste handling requirements (verify with contractor just in case).

8. Is the house to be demolished?
- ☐ Yes.
- ☐ No. Go to question 10.

9. If yes, then is there greater than:

260 feet of pipe wrap or 160 square feet off facility components ***or***
35 cubic feet of facility components where the length or area could not be measured?

- ☐ Yes. An abatement will probably be necessary. Call Jess Richards at the MPCA (282-9885) to find out if the materials qualify for an exemption from abatement and can be demolished with the house. (Exempted materials include non-

friable tile or asphalt products that are in good condition, ACM that is encased in concrete and kept wet during demolition and any other materials that when dry cannot be crumbled or reduced to powder by hand pressure). An exemption from the abatement requirements does not exempt us from EPA/MPCA landfilling and notification requirements. If we (or homeowner) qualify for an exemption from abatement and choose the option to have the ACM landfilled with the demolition debris then we must: 1.) call Elk River Landfill ASAP at 441-2464 to verify that they will accept the asbestos containing demolition debris and to see what kind of waste handling procedures we must follow 2.) give a 10 working day notice to the MPCA that there will be a demolition of a house that contains asbestos. If an abatement is necessary then the abatement contractor will deal with the notification and waste handling issues (verify with contractor).

- ☐ No. We are exempt from EPA/MPCA abatement requirements but we still must follow the EPA/MPCA landfilling and notification requirements. We must: 1.) call Elk River Landfill ASAP at 441-2464 to verify that they will accept the asbestos containing demolition debris and to see what kind of waste handling procedures we must follow 2.) give a 10 working day notice to the MPCA that there will be a demolition of a house that contains asbestos.

10. Done with asbestos questions unless the home has four or more dwelling units (a fourplex) in which case Department of Health regulations may apply. DOH regulations pertain to the methods used to remove asbestos and cleanup afterwards and therefor they are the concern of the homeowner or asbestos removal contractor. If the house has four or more dwelling units call the DOH at 215-0700. The DOH exemption basically states that asbestos work on greater than 10 linear feet or 6 square feet must be done by a certified contractor unless ACM is flooring, ceiling, siding or roofing materials in homes with four dwelling units or less. This ACM is exempt from DOH rules and therefore a homeowner may remove some ACM themselves depending on the type and quantity of the ACM. This may change for flooring materials with ACM paper backing since EPA regulations are now considering this ACM to be friable.

Section 2.5 Infectious Hazards

Animal Wastes

1. Are there any animal wastes (dead or decaying carcasses, excrement) on site?
- ☐ Yes.
- ☐ No.

If yes, animal carcasses should be removed from the site prior to work activities. Animal excrement should be dealt with by removal or by wearing a HEPA respirator when working in contaminated areas. How will animal wastes be dealt with at the site?

Pests

2. Are there any pests of concern (mice, rats, bugs, dogs, bats, pigeons, etc.) at the site?
- ☐ Yes.
- ☐ No.

If yes, then how will employees be protected from bites or nuisance?

Section 2.6 Structural Integrity

General Building Integrity

1. Are there any areas of the building for which structural integrity is a concern?
- ☐ Yes.
- ☐ No.

If yes, where?

What precautions will be taken to assure that employees are not injured or the building structure damaged due to a weakness in the structure?

2. Are there any areas of the building for which you can foresee structural integrity issues as the project proceeds?
- ☐ Yes.
- ☐ No.

If yes, how will it be assured that these issues do not result in employee injuries or damage to the building?

3. How will it be assured that structural integrity issues will be recognized and addressed as they come up during the project?

Flooring or Railing Voids

OSHA standards require that employees be protected from falling through voids in flooring or off of edges of work areas (when there is a 6 ft drop to the next level) and from objects that may fall through voids in floors above them.

Stairrail systems should be about 30-36 inches high and should have some kind of intermediate members (midrails, screens, etc.) so that there are no openings greater than a 19 inch diameter circle. Stairrails and guardrails should be strong enough to hold a person's weight (200 lb).

4. Do all of the flooring and stairrail systems on site comply with the above OSHA standards?

- ❑ Yes.
- ❑ No.

If no, what will be done to assure that employees are not injured due to flooring or railing voids?
(Note: Guardrails, covers, barricades, safety nets, personal fall arrest systems, or fall protection plans can be used to protect against fall hazards. Hard hats can be used to protect against falling objects.)

Hanging or Protruding Objects

5. Are there any hanging (ex. hanging light fixtures, electrical wires, etc.) or protruding objects (ex. partially removed trim, nails, loose boards, metal fasteners, etc.) that could cause injury?

- ❑ Yes.
- ❑ No.

If yes, then what and where are they?

How will they be dealt with (remove the hazard or alter it to reduce the hazard)?

Green Institute DeConstruction Safety Program
Pre-Work Site Evaluation

Section 2.7 Electricity and Natural Gas

Electricity

1. Will electricity be cut from the building?

- ☐ Yes.
- ☐ No.

If no, how will it be assured that employees are not exposed to live electricity throughout the duration of the project (training, lock-out/tag-out, etc.)?

If yes, who is responsible for cutting the electricity? _____
When will the electricity be cut? _____

If yes or no, until the electricity is cut, how will it be assured that employees are not exposed to live electricity (training, lock-out/tag-out, GFCI, etc.)?

2. Will a generator be used on site?

- ☐ Yes.
- ☐ No.

If yes, where will fuel for the generator be stored to assure that it does not create a fire hazard?

Natural Gas

3. Will the natural gas lines be active for all or part of the project?

- ☐ Yes.
- ☐ No.

If yes, list any deconstruction activities that could result in a leak or opening in the gas lines.

If no, who is responsible for shut off? _____
When will shut off occur? _____

If yes or no, until the gas lines are inactivated, how will it be assured that de-construction activities will not result in a leak or opening of the gas lines?

Green Institute DeConstruction Safety Program
Pre-Work Site Evaluation

Section 2.8 Sanitation

Sanitation

1. Are bathroom facilities available at the site?
- ❑ Yes.
- ❑ No.

If no, then bathroom facilities must be provided on site or employees must be allowed to leave the worksite for public facilities.

2. Is soap and water available for washing?
- ❑ Yes.
- ❑ No.

If no, then soap, water, and towels must be brought on site for washing. This is a general rule for all sites but is imperative if working in areas where leaded paints or animal wastes are a concern.

3. Is there a drinking water source available on site?
- ❑ Yes.
- ❑ No.

If no, then a source of drinking water must be provided. This is a general rule for all sites but is imperative if working in hot or poorly ventilated environments where heat stress may occur.

Green Institute DeConstruction Safety Program
Pre-Work Site Evaluation

Part 3. Operational

3.1 Illumination
MN Rules require sufficient illumination in work areas.
1. Are there any areas of the building for which proper lighting is a concern?

- ☐ Yes.
- ☐ No.

If yes, how will proper lighting be maintained in these areas (bring in lights, open area to outdoor light, etc.)?

3.2 Security
1. Does the public have access to the property?

- ☐ Yes.
- ☐ No.

If yes, then where are the property access points?

How will the property access points be secured from the public during de-construction activities (ex. temporary fence, barricades, cones and tape)?

2. Can the public access to the building during off-hours?

- ☐ Yes.
- ☐ No.

If yes, then where are the building access points?

How will the building access points be secured from the public (ex. boarding off, locking)?

3. What building access points will be created through de-construction activities and where are they?

How will these access points be secured from the public?

4. Is there a place to store materials securely?

- ❑ Yes.
- ❑ No.

If yes, what is the designated location for materials storage?

If no, how will it be assured that materials that accumulate on the worksite do not create a hazard in employee work areas?

5. What are the floor to ceiling and grade to roof heights?

Locations: Heights (ft):

6. Is silt fencing needed?

- ❑ Yes.
- ❑ No.

If yes, who will install it?

When will it be installed?

7. Is security fencing needed?

- ❑ Yes.
- ❑ No.

If yes, who will install it?

When will it be installed?

Task List for De-Construction Health and Safety Research Project

Project Length: 12/15/97 - 9/27/98

Task	Hours	Comments
PRACTICAL		
Regulatory Review		
Federal OSHA	120	First task of project was to review federal OSHA general (29 CFR 1910) and construction specific (29 CFR 1926) regulations. As most of the regs in 1910 are superceded by 1926 most of this time was spent reviewing 1926. Because of the length and detail in the regs they were read over once and then read over again prior to making the index/summary. Towards the end of the project an additional review was done and the index was updated. This time also includes time spent referencing the regs for training and compliance purposes.
Federal OSHA index/summary	55	This summary lists all of the citations in 29 CFR 1926, title or citation, whether or not they are applicable to deconstruction and relevant comments to deconstruction. The summary was done after the second review of regulations and was updated agaiin at the end of the project when the regs were reviewed for the last time.
MN Rules	45	MN OSHA Rules were reviewed. MN Rules make a general reference to 29 CFR 1926 and have some additional standards specific for MN construction industries. MN Rules also have a section on administrative rules and enforcement logistics.This also includes reviewals of Minnesota Department of Health regulations.
MN Rules index/summary	15	A summary of the MN OSHA Rules.
Safety Regulation Summaries (SOPs)		The most practical way to turn regulations into operation procedures seemed to be to start with the regs, make a document listing the citation and the requirement as it applies to us and then to remove the citations and edit language to be usable as an SOP. Leaving the citations in makes it appear too much like the regulations themselves and adds confusion. The original file, with citations, is kept in electronic form in C:/Safety/regs. The SOP form is kept electronically in C:/Safety/sops and hard copies of both are in the Safety Program binder.
power and hand tools	14	Created an SOP based on 29 CFR 1926 Subpart I Hand and Power Tools. If in compliance with this SOP deconstruction will be in compliance with OSHA regulations for the use of hand and power tools. Also in the file is a copy of this SOP with the corresponding OSHA citations.
scaffolding	8	Created an SOP based on 29 CFR 1926 Subpart L Scaffolding. If in compliance with this SOP deconstruction will be in compliance with OSHA regulations regarding working on or around scaffolding. Also in the file is a copy of this SOP with the corresponding OSHA citations (?).
fall protection	5	
stairways and ladders	12	Created an SOP based on 29 CFR 1926 Subpart X Stairways and Ladders. If in compliance with this SOP deconstruction will be in compliance with OSHA regulations regarding workplace staurways and ladders. Also in the file is a copy of this SOP with the corresponding OSHA citations.
asbestos	18	Started with an SOP based on the regs - bad idea. As issues came up enough was learned to write a much more practical document. The end result is a site evaluation sheet that is to be used as a checklist for and new house to be deconstructed. Bob Alf requested a single checklist (Site Evaluation) that could be used to go over all safety considerations includin structural integrity issues and other things not specificly written in the regs. See Site Evaluation in AWAIR Section of this summary.
PPE	3	Basic guidance on when to use PPE. Prepared for new employees and should be given out with ERTK and New Employee Orientation.
AWAIR Program		An AWAIR Program is an overall safety program required by MN Statutes.
Written Program	60	Started with review of OSHA guidance, draft of AWAIR, review with BA, edit, edit, edit as more was learned. One more edit at end of project.
Site Evaluation Form	35	Bob requested an all inclusive Site Evaluation with names and phone numbers to contact with questions. This evaluation covers all safety considerations and some operational considerations. This document walks the inspector though what hazards may be found, where to find them, what to do about it and who to call with further questions. Though not making specific references to citations, the checklist covers all EPA/MPCA, DOH and OSHA asbestos regulations applicable to deconstruction as well as regs on voids regarding flooring and stairrails, workplace lighting, wells, USTs, HHW, leaded paints, etc. The resources used to make this checklist include calls to MPCA, DOH, OSHA, and discussions with two independent consultants as well as repetitive reviewal of EPA NESHAP M which covers asbestos regulations for demolition/renovation activities,OSHA standards and some reviewal of DOH standards and fact sheets. All of the fact sheets and regs are on file in the safety files. Phone conversations are documented (haphazardly) in my notebooks.
Hazard Analysis Tables	15	AWAIR program (and ERTK) Tables 1 and 2 list all of the physical and toxicological hazards an employee may come into contact with on a deconstruction site. They also list how to avoid or control these hazards. Info for this table was gathered through on site experience, safety discussions in weekly meetings and safety information resources.

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OSHA, MPCA, DOH contacts	3	Created a phone list of good contacts at MN OSHA, the MPCA and the DOH. The time it actually takes to develop a list of persons to contact takes much greater time than that noted here to make the list. Many of these contacts are also noted in the Site Evaluation checklist.
DeConstruction Safety Brochure		
Brochure	25	Created a very basic brochure (DeConstruction and Safety - lessons learned from the Green Institute) to give to people considering starting deconstruction programs.
Cost Effectiveness Calculations		
Asbestos Certifications	15	Reviewing regs for various levels of asbestos training, calling training resources for costs of training, made a spreadsheet to calculate the cost effectiveness of getting an employee asbestos certified as opposed to contracting out asbestos inspection and removal work. Came to the conclusion that it is cost effective to have a person certified as an asbestos inspector provided that the turnaround for trained employees is not greater than two per year. Certifying an inspector is very cost effective if inspector stays for over 1 year (annual recertification is much cheaper than the initial training).
ACADEMIC		
Review of Existing Data		
Injury and illness in construction	20	Basic literature search for information on safety and injury in the construction industry.
Lead and asbestos in construction	12	Basis literature search for exposure data for lead paint activities.
Infectious disease exposures	6	Searching for info on histoplasmosis, rabies and hantavirus as diseases caused from exposure to animals or their wastes. Photocopied info on diseases from "Communicable Diseases Manual."
Chemical exposures	12	Acquired information on chemical exposures from the Department of Health, MN OSHA and other sources. Reviewed info and incorporated into ERTK program. All info kept in safety files under appropriate title (lead, HHW, etc.)
Construction vs. Deconstruction		
Spreadsheets	25	More importantly have done an analytical comparison of the accident rate (per 100 full time employees per year) that can be compared to statistics in similar industries and can be easily updated to see how decon's accident rate changes. Though decon has a very small sample size relative to the industries to which it is compared, the comparison is still useful. Also made a table that can be used to compare the type of accidents occuring in decon to the types of accidents that occur in general construction.
Paper	1	Paper discussing analytical results.
Exposure Assessment		
Bulk samples	16	Collecting PACM and paint samples, bringing to the U for testing for asbestos or lead content.
Lead Wipe Samples	8	Reviewing sampling protocol for lead wipe samples, taking wipe samples at the ReUse Center, paperwork and shipping to EMSL lab for analysis. Also took lead wipe samples from 2 deconstruction sites in which lead air samples were taken.
Training on air sampling	20	Trained by Roger Jeremiah at DEHS to use air pumps for sampling. Collected and reviewed information on sampling cartridge types and uses, sampling protocols and sample analysis, calls to order equipment and have samples analyzed. Input from Neil Carlson at DEHS re: sampling for molds, pollen, insect fragments and fecal material. Resources: DEHS personnel, DEHS webpage, vendor information on sampling and analysis, Perry's Chem E handbook (info on analysis).
Researching bioaeresol hazards and sampling technique	9	Reviewing info from DEHS and EMSL on indoor air quality. Literature search on Anderson sampling technique and review of article.
Collecting air samples	30	Collecting air samples while pulling lead painted trim and tile; paperwork; bring bulk samples to the U for lead content and send cartridges to EMSL for analysis.
Spreadsheet of sampling results	20	Spreadsheet listing where samples taken, when taken, activity during which taken, analysis method, analysis results.
Research paper on exposures	0	An anlysis of existing data and data found through sampling at de-construction sites.
Methods		
Documentation of research	15	Documenting the methods through which the research was done, including reflection on more productive or effective ways to do things. This spreadsheet provides a detailed listing of the methods used and tasks done. A 5 page (approximately) text summary of activities and proposed further activities will be done for CURA submittal.
Final Research Paper		
Paper for submittal to CURA	35	

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Task	Hours	Comments

ACM = Asbestos Containing Material. Materials that contain > or = 1% asbestos fibers.
AWAIR = A Workplace Accident and Injury Reduction Program.
CFR = Code of Federal Regulations
CURA = Center for Urban and Regional Affairs at the Humphrey Institute, University of Minnesota.
DEHS = Department of Environmental Health and Safety (U of M)
DOH = Department of Health. A Minnesota agency in charge of protecting the health of the public.
EMSL = commercial lab that does various indoor air quality sampling analyses.
ERTK = Employee Right To Know Program. Required through Federal OSHA Hazard Communication regulations 29 CFR 1910.1200
HHW = Household Hazardous Waste (mercury switches, batteries, freon, lights, etc.)
MPCA = Minnesota Pollution Control Agency. State agency with jurisdiction over most EPA regulations, also have jurisdiction over state environmental regulations.
MSC = Minnesota Safety Council. An organization to which Green Institute has a membership. MSC offers various training courses and has free safety video rental.
NESHAP = National Emission Standard for Hazardous Air Pollutants. EPA regulations regarding emission of hazardous materials into the air.
OSHA = Occupational Safety and Health Administration. OSHA implies federal OSHA, MN OSHA implies Minnesota OSHA.
PACM = Potential Asbestos Containing Material. Materials that may contain asbestos but testing has not yet been done.
PPE = Personal Protective Equipment (masks, gloves, steel toe boots, etc.)
SOP = Standard Operating Procedure
UST = Underground Storage Tanks